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EXAMINER	
CANTELMO, GREGG	
ART UNIT	**PAPER NUMBER**
1745	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/017,470	PEARSON, MARTIN T.
	Examiner	Art Unit
	Gregg Cantelmo	1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 December 2001* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4-7* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statements filed March 14, 2002, September 23, 2002, November 8, 2002 and August 12, 2003 have been placed in the application file and the information referred to therein has been considered as to the merits.

Drawings

2. The drawings are objected to because the lead line for reference number 24 in Fig. 8 appears to be incorrect. Reference number 24 denotes a battery. In Fig. 8 the battery 24 is shown as batteries 24a, 24b, ..., 24n. The lead line from reference number 24 is connected to the circuit line wherein a capacitor 140 is provided and not to the batteries shown in Fig. 8. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the invention of claims 58-63 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

4. The disclosure is objected to because of the following informalities: page 15 of the instant application refers to applications only by the attorney's docket number. References to applications identified only by the attorney's docket number should be required to be canceled. See 37 CFR 1.78 and MPEP § 202.01.1 and 608.01.

Appropriate correction is required.

5. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: the specification does not appear to clearly recite: holding a pressure of the at least one reactant flow approximately constant while adjusting the partial pressure of the at least on reactant flow (claims 8, 12 and 18), the mathematically defined relation between the determined deviation and the partial pressure of the reactant flow is an inversely proportional relationship (claim 16), the control circuit comprising an alternator controller (claim 25), the fuel cell system of claims 58-63.

Claim Objections

6. Claim 57 is objected to because of the following informalities: the term "the at least on reactant delivery system" should be the at least one reactant delivery system. Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 8, 12, 18, 28, 43, 44 and 57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claim 8 recites that the pressure of the at least one reactant flow is held approximately constant while adjusting the partial pressure of the reactant flow. It is unclear how the at least one reactant flow can be held constant while simultaneously being adjusted. The specification does not shed ample light on interpretation of the intended relationship in the claim since the specification does not appear to have antecedent basis for this relationship. For such reasons the Examiner is unable to reasonably interpret the claims in light of the disclosure and absent clarity from Applicant, cannot apply prior art at this time in prosecution. This applies to claims 12, 18 and 57 as well. It would appear that these claims are not within the scope of their respective dependent claims. For example in claim 57, the independent base claim limitations state "adjusting a partial pressure of the reactant flow" which is later contradicted by the language in claim 57 which recites "holding a pressure of the at least one reactant flow approximately constant". Claim 57 thus teaches of both a constant *and* adjusted partial pressure and it unclear which conditions the claimed invention is drawn to.

b. Claim 16 is unclear. Therein claim 16 recites that the mathematical relationship between the determined deviation and the partial pressure of the reactant flow are inversely proportional. It is unclear exactly how these relationships are inversely proportional

c. Claim 28 is unclear. It is unclear how holding the pressure of the reactant flow constant during the controlling of the first element based on the deviation is permissible when it would appear that the reactant flow to the fuel cells is adjusted in order to compensate for the deviation of a condition of the battery.

d. Claim 43 is unclear. It is not clear how the groups of battery cells (each group being separate) includes a singe one of the same battery cells. Each group of battery cells cannot include a single one of the cells and still be held to be plural groups. This linearly applies to claim 44 with respect to the use of the term "fuel cells";

e. Claim 44 recites the limitation "the groups of fuel cells" in line 1. There is insufficient antecedent basis for this limitation in the claim. Claim 41 recites a fuel cell stack having a number of fuel cells but not of a group of fuel cells.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claim 37 is rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent No. 4,931,947 (Werth).

Werth discloses a method of operating a fuel cell comprising: electrically coupling a fuel cell stack 10 having plural cells with a battery having plural cells 12 and 14 and supplying current to a load device 16 to the stack and cells (Fig. 1 as applied to claim 37).

11. Claims 1, 2, 5-7, 9-11, 13, 15, 17, 21-23, 26-33, 35-36, 50-53 and 55-57 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent No. 4,883,723 (Yamamoto).

With respect to the method claims, Yamamoto discloses a fuel cell apparatus and method of operating comprising: supplying current to the load 5 from at least one of a fuel cell stack 3 (note that the term stack has been interpreted be one or more fuel cells) and a battery 6 electrically coupled in parallel with the fuel cell stack 3; determining an operational condition of the battery 6; determining an amount of deviation of the determined operational condition of the battery from a desired operational condition of the battery; and for at least one reactant flow (fuel pump 7 and air blower 9 to the fuel cell) to at least a portion of the fuel cell stack, adjusting a partial pressure of the reactant flow based on the determined amount of deviation (Fig. 1, col. 2, ll. 47-67, col. 3, ll. 10-35 and col. 4, ll. 1-64 as applied to claims 1, 9, 13 and 17).

The method includes determining current flow into and out of the battery 6 over a period of time via current detector 11 (Fig. 1 and col. 4, ll. 13-20 as applied to claim 2).

The determining an operational condition of the battery includes determining a voltage across the battery via voltage detector 13 (Fig. 1 as applied to claim 5).

The determining an amount of deviation of the determined operational condition of the battery from a desired battery operational condition includes comparing a determined battery charge to a defined desired nominal battery charge (col. 3, ll. 10-31 and col. 4, ll. 13-64 as applied to claim 6).

The controller adjusts the air blower 9 and fuel cell methanol reactant pump 7 in response to the deviation in the comparison between the actual system conditions of the battery (voltage, current and capacity) to the target conditions (col. 4, ll. 36-64 as applied to claim 7).

The method includes determining current flow into and out of the battery 6 over a period of time via current detector 11 and determining the voltage of the battery via detector 13 (Fig. 1 and col. 4, ll. 13-29) and adjusting the air blower 9 and fuel cell methanol reactant pump 7 in response to the deviation in the comparison between the actual system conditions of the battery (voltage, current and capacity) to the target conditions (col. 4, ll. 36-64 as applied to claims 10 and 11).

The desired nominal charge of the battery is at least 80% (col. 3, ll. 10-20) which is between approximately 75% and approximately 95% percent of a full charge for the battery (as applied to claim 15).

With respect to the system: Yamamoto discloses a fuel cell system for providing power to a load 5, comprising: a fuel cell stack 3 having a number of fuel cells (interpreted as one or more fuel cells); a battery 6 having a number of battery cells

(interpreted as one or more batteries) electrically couplable in parallel across the fuel cell stack 3; a reactant delivery system (including methanol tank 1, fuel pump 7, air blower 9)for delivering reactant to the fuel cells, the reactant delivery system including at least a first control element (pump 7 or blower 9) adjustable to control a partial pressure in a flow of a reactant to at least some of the fuel cells; and a control circuit 12,15 and Ifc coupled to receive signals corresponding to an operating condition of the battery and configured to determine a deviation of the operating condition of the battery from a desired operational condition of the battery based on the received signals, the control circuit further coupled to control the at least first control element based on the determined deviation (Fig. 1 as applied to claims 21, 29, 33, 35, 50, 53 and 56).

Current sensor 11 is coupled to measure a flow of current into and out of the battery and to provide the measured flow of current to the control circuit as the signals corresponding to the operating condition of the battery (Fig. 1 as applied to claim 22).

Voltage sensor 13 is coupled to measure a voltage across the battery and to provide the measured voltage to the control circuit as the signals corresponding to the operating condition of the battery (Fig. 2 as applied to claim 23).

The battery and fuel cells are coupled in parallel (Fig. 1 as applied to claim 27).

A control circuit 12,15 and I_{fc} coupled to receive signals corresponding to an operating condition of the battery and configured to determine a deviation of the operating condition of the battery from a desired operational condition of the battery based on the received signals, the control circuit further coupled to control the at least

first control element (blower or fuel pump) based on the determined deviation (Fig. 1 as applied to claim 30).

The control circuit is coupled to the battery current sensor for receiving data regarding the current of the battery. The control circuit is also coupled to the fuel cell reactant fuel pump and oxidant blower to control the rates of flow of the fuel and oxidant to the fuel cell (Fig. 1 as applied to claims 31 and 51).

The control circuit is coupled to the battery voltage sensor for receiving data regarding the voltage of the battery. The control circuit is also coupled to the fuel cell reactant fuel pump and oxidant blower to control the rates of flow of the fuel and oxidant to the fuel cell (Fig. 1 as applied to claims 32 and 52).

Voltmeter 13 in conjunction with the controller 12 is construed to be a voltage regulator since the sensed conditions of the battery are supplied to the controller to analyze the incoming signals and make the necessary adjustments to the system to compensate for variations in battery conditions. Additionally note that the specification fails to clearly define what the instant invention construes to be a "voltage regulator" (Fig. 1 as applied to claim 36).

With respect to the apparatus claims and limitations therein drawn to the operation of the apparatus (claims 28, 30-32, 51-52 and 56-57): Yamamoto discloses that the control unit is configured to control the fuel pump and oxidant blower for providing the reactants to the fuel cell. The structure of the apparatus of Yamamoto does not appear to be different from the claimed invention. And the manner of using the

configuration of claim 28 is not significant with respect to the apparatus since the manner of using does not structurally define the apparatus.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 3, 4, 14, 15, 24, 25, 34 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of U.S. patent No. 3,800,208 (Macharg).

The teachings of Yamamoto have been discussed above and are incorporated herein.

The differences between claims 3, 4, 14, 15, 24, 25, 34 and 54 and Yamamoto are that Yamamoto does not disclose integrating the difference between a nominal charge and full charge (claims 3, 4, 14 and 15) or of providing an integrator and comparator (claims 24, 25, 34 and 54).

Macharg discloses of using an integrator and comparator to integrating the difference between a nominal charge and full charge of the battery.

The motivation for using the arrangement and function of the integrator and comparator of Macharg is that it provides a means to monitor the state of the battery and respond to variances in the charge of the battery to optimize charge of the battery and the power to the load.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yamamoto by using an integrator and comparator and integrating the difference between a nominal charge and

full charge of the battery since it would have provided a means to monitor the state of the battery and responded to variances in the charge of the battery to have optimized the charge of the battery and power to the load.

14. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of U.S. patent No. 4,931,947 (Werth).

The teachings of Yamamoto have been discussed above and are incorporated herein.

The difference between claim 20 is of using plural batteries in separate cases (claim 20).

Yamamoto exemplifies a single battery in connection with the load and fuel cell. It is known to employ plural batteries in separate cases as shown by Werth (Fig. 1 as applied to claim 20).

The motivation for using plural batteries is that a multiple-battery system enhances system reliability by avoiding the problem of a single bad cell in one of the batteries causing the entire system to become inoperable. The concept also provides operational flexibility in that, while one battery is being cycled, the other battery equalizes and cools off. The system also enhances flexibility in system configuration and package design. This embodiment also provides means for enhancing the overall efficiency of the hybrid system since various energy source combinations are possible depending on the battery charge level and the current load. Switching between the power sources is arranged to provide for maximum efficiency by allowing the fuel cell stack to operate close to its average rated power output for all load demand conditions.

The fuel cell, when connected to the load, is also utilized to charge the batteries as appropriate, the shifting of load to the fuel cell stack minimizing battery-run down by avoiding battery overcharge or overdischarge. This aspect extends battery life (col. 3, ll. 16-35).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yamamoto by using plural batteries since it would have enhanced system reliability by avoiding the problem of a single bad cell in one of the batteries causing the entire system to become inoperable. The concept also would have provided operational flexibility in that, while one battery is being cycled, the other battery equalizes and cools off. The system also would have enhanced flexibility in system configuration and package design. This embodiment also would have provided means for enhancing the overall efficiency of the hybrid system since various energy source combinations are possible depending on the battery charge level and the current load. Switching between the power sources would have provided for maximum efficiency by allowing the fuel cell stack to operate close to its average rated power output for all load demand conditions. This also would have reduced the shifting of load to the fuel cell stack minimizing battery-run down by avoiding battery overcharge or overdischarge.

15. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of U.S. patent No. 4,931,947 (Werth) and U.S. patent No. 5,482,790 (Yamada).

The teachings of Yamamoto have been discussed above and are incorporated herein.

The difference between claim 19 is of using plural batteries in a single case.

With respect to using plural batteries:

Yamamoto exemplifies a single battery in connection with the load and fuel cell. It is known to employ plural batteries in separate cases as shown by Werth (Fig. 1).

The motivation for using plural batteries is that a multiple-battery system enhances system reliability by avoiding the problem of a single bad cell in one of the batteries causing the entire system to become inoperable. The concept also provides operational flexibility in that, while one battery is being cycled, the other battery equalizes and cools off. The system also enhances flexibility in system configuration and package design. This embodiment also provides means for enhancing the overall efficiency of the hybrid system since various energy source combinations are possible depending on the battery charge level and the current load. Switching between the power sources is arranged to provide for maximum efficiency by allowing the fuel cell stack to operate close to its average rated power output for all load demand conditions. The fuel cell, when connected to the load, is also utilized to charge the batteries as appropriate, the shifting of load to the fuel cell stack minimizing battery-run down by avoiding battery overcharge or overdischarge. This aspect extends battery life (col. 3, ll. 16-35).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yamamoto by using plural batteries since it would have enhanced system reliability by avoiding the problem of a single bad cell in one of the batteries causing the entire system to become inoperable. The concept also would have provided operational flexibility in that, while one battery is being cycled, the other battery equalizes and cools off. The system also would have enhanced flexibility in system configuration and package design. This embodiment also would have provided means for enhancing the overall efficiency of the hybrid system since various energy source combinations are possible depending on the battery charge level and the current load. Switching between the power sources would have provided for maximum efficiency by allowing the fuel cell stack to operate close to its average rated power output for all load demand conditions. This also would have reduced the shifting of load to the fuel cell stack minimizing battery-run down by avoiding battery overcharge or overdischarge.

With respect to placing plural batteries in a single case:

Yamada discloses using batteries in separate cases 45a and 45b (Fig. 3) or in a single case 14 (Fig. 7).

The motivation for providing the batteries in a single case is that it reduces the space required for the batteries.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yamamoto by providing

plural batteries in a single case since it would have reduced the size of the overall system by having reduced the space required for the batteries.

16. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of U.S. patent No. 5,339,018 (Brokaw).

The teachings of Yamamoto have been discussed above and are incorporated herein.

The difference between claim 25 and Yamamoto is that Yamamoto does not disclose of using an alternator controller.

Brokaw discloses using an alternator controller in combination with a battery power circuit in order to control the excitation current of the alternator as a function of the battery voltage (col. 4, ll. 40-50).

The motivation for using an alternating controller is that it controls the excitation current of the alternator as a function of the battery voltage.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yamamoto by using an alternating controller since it would have controlled the excitation current of the alternator as a function of the battery voltage.

17. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of U.S. patent No. 4,839,574 (Takabayashi).

The teachings of Yamamoto have been discussed above and are incorporated herein.

The difference between claim 26 and Yamamoto is that Yamamoto does not disclose of using a microprocessor.

Takabayashi discloses a similar arrangement to Yamamoto (see Fig. 1 of each reference). Takabayashi discloses using a microprocessor for the control system 12.

The motivation for using a microprocessor is that it would have provided a means for automating the system.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yamamoto by using a microprocessor as taught by Takabayashi since it would have provided means for automating the system.

18. Claims 37-43 and 47-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of U.S. patent No. 4,931,947 (Werth).

Yamamoto discloses a fuel cell apparatus and method of operating comprising: supplying current to the load 5 from at least one of a fuel cell stack 3 (note that the term stack has been interpreted be one or more fuel cells) and a battery 6 electrically coupled in parallel with the fuel cell stack 3; determining an operational condition of the battery 6; determining an amount of deviation of the determined operational condition of the battery from a desired operational condition of the battery; and for at least one reactant flow (fuel pump 7 and air blower 9 to the fuel cell) to at least a portion of the fuel cell stack, adjusting a partial pressure of the reactant flow based on the determined amount of deviation (Fig. 1, col. 2, ll. 47-67, col. 3, ll. 10-35 and col. 4, ll. 1-64 as applied to claims 37, 38 and 41).

A control circuit 12,15 and I_{fc} coupled to receive signals corresponding to an operating condition of the battery and configured to determine a deviation of the operating condition of the battery from a desired operational condition of the battery based on the received signals, the control circuit further coupled to control the at least first control element (blower or fuel pump) based on the determined deviation (Fig. 1 as applied to claim 42).

A control circuit 12,15 and I_{fc} coupled to receive signals corresponding to an operating condition of the battery and configured to determine a deviation of the operating condition of the battery from a desired operational condition of the battery based on the received signals, the control circuit further coupled to control the at least first control element (blower or fuel pump) based on the determined deviation. The control circuit is coupled to the battery current sensor for receiving data regarding the current of the battery. The control circuit is also coupled to the fuel cell reactant fuel pump and oxidant blower to control the rates of flow of the fuel and oxidant to the fuel cell (Fig. 1 as applied to claim 47).

The method and apparatus further includes determining current flow into and out of the battery 6 over a period of time via current detector 11 (Fig. 1 and col. 4, ll. 13-20 as applied to claims 39 and 48).

The determining an operational condition of the battery includes determining a voltage across the battery via voltage detector 13 (Fig. 1 as applied to claims 40 and 49).

The difference between claims 41 and 43 are of using groups of the battery cells (claim 41) and wherein the groups of battery cells each include a single cell (claim 43).

Yamamoto exemplifies a single battery in connection with the load and fuel cell. It is known to employ plural groups of single cell batteries as shown by Werth (Fig. 1).

The motivation for using plural batteries is that a multiple-battery system enhances system reliability by avoiding the problem of a single bad cell in one of the batteries causing the entire system to become inoperable. The concept also provides operational flexibility in that, while one battery is being cycled, the other battery equalizes and cools off. The system also enhances flexibility in system configuration and package design. This embodiment also provides means for enhancing the overall efficiency of the hybrid system since various energy source combinations are possible depending on the battery charge level and the current load. Switching between the power sources is arranged to provide for maximum efficiency by allowing the fuel cell stack to operate close to its average rated power output for all load demand conditions. The fuel cell, when connected to the load, is also utilized to charge the batteries as appropriate, the shifting of load to the fuel cell stack minimizing battery-run down by avoiding battery overcharge or overdischarge. This aspect extends battery life (col. 3, ll. 16-35).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yamamoto by using plural batteries since it would have enhanced system reliability by avoiding the problem of a single bad cell in one of the batteries causing the entire system to become inoperable.

The concept also would have provided operational flexibility in that, while one battery is being cycled, the other battery equalizes and cools off. The system also would have enhanced flexibility in system configuration and package design. This embodiment also would have provided means for enhancing the overall efficiency of the hybrid system since various energy source combinations are possible depending on the battery charge level and the current load. Switching between the power sources would have provided for maximum efficiency by allowing the fuel cell stack to operate close to its average rated power output for all load demand conditions. This also would have reduced the shifting of load to the fuel cell stack minimizing battery-run down by avoiding battery overcharge or overdischarge.

19. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of Werth as applied to claim 41 above and in further view of 4,721,660 (Kujas).

The teachings of Yamamoto have been discussed above and are incorporated herein.

The difference not yet discussed is of the number of fuel cells in each of the groups being greater than the number of battery cells in the groups of cells (claim 45). With respect to claim 45:

It is well known in the art that individual fuel cells have a much lower voltage output than other batteries, generally less than 1 volt per cell (Kujas, col. 2, ll. 21-38). In order to generate a desired voltage output comparable to the voltage output of the battery, 12 Volts, it would have been obvious to provide more fuel cells in the stack

relative to the batteries so that the voltage output of both the fuel cell stack and batteries are identical.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yamamoto by providing more fuel cells in the stack relative to the batteries since it would have provided an arrangement wherein the voltage output of both the fuel cell stack and batteries were identical.

20. Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto in view of Werth as applied to claim 41 above and in further view of U.S. patent Nos. 6,100,665 (Alderman) and 5,318,142 (Bates).

The teachings of Yamamoto have been discussed above and are incorporated herein.

The difference not yet discussed is providing a super capacitor in parallel across the battery.

Alderman discloses providing capacitors in parallel across the electrical power system which includes both a battery 18 and fuel cell 14 (Fig. 2).

The motivation for providing capacitors in parallel across the battery is that it improves the charging of the battery.

Supercapictors are known as high power/low energy devices (Bates, col. 5, ll. 6-18).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yamamoto by providing a

capacitor in parallel with the battery since it would have improved the charging of the battery.

It would have further been obvious to ordinary skill in the art at the time the claimed invention was made to modify the teachings of Yamamoto by providing a super capacitor since it would have improved the power of the system at a lower operating energy.

Double Patenting

21. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

22. Claims 1-7, 9-11, 13-15, 17, 21-24, 26-28, 30-35, 50-53 and 58-63 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims of U.S. Patent No. U.S. patent No. 6,573,682 (USPAT '682). Although the conflicting claims are not identical, they are not patentably distinct from each other.

Although the scope of USPAT '682 is not identical to the scope of the instant claims, the limitations claimed within USPAT '682 recite ample limitations to anticipate the instant claims and are held to be obvious variants. Anticipation being the epitome of obviousness.

USPAT '682 claims a method of operating a fuel cell comprising: supplying current at a number of output terminals from at least one fuel cell stack and a battery electrically coupled in parallel with the fuel cell stack and adjusting the partial pressure of a reactant flow to at least a portion of the fuel cell to maintain a desired nominal charge on the battery (claim 32 as applied to instant claims 1, 2, 6, 9, 10, 13 and 17).

The period of time in claim 2 is unspecified and can be any amount of time. The copending application determines the current flow and thus does so for an inherent amount of time (claims 32 as applied to claim 2).

A difference between the determined condition and desired condition is integrated (claim 14 as applied to claims 3 and 14).

A difference between the determined condition and desired condition is integrated and the amount of deviation is between 75 and 95% of the full charge of the battery (claims 14 and 43 as applied to claim 4).

Both the fuel and oxidant flows are claimed to be manipulated in the same manner in both USPAT '682 (claim 44 applied to instant claim 7).

The method further comprises determining the voltage across the battery and determining the deviation of the voltage across the battery from a desired nominal voltage wherein adjusting the partial pressure of the reactant flow to at least a portion of

the fuel cell stack is based on the amount of deviation (claim 34 as applied to claims 5, 11 and 17).

The amount of deviation is between 75 and 95% of the full charge of the battery (claim 43 as applied to claim 15).

The apparatus of claims 21, 29-31 33, 35, 50 and 53 are respectively encompassed by the apparatus limitations set forth in claim 1 of USPAT '682 wherein claim 1 recites a fuel cell stack having a number of cells, a battery having a number of cells couplable in parallel to the fuel cell stack, a reactant delivery system and a control circuit (as applied to claims 21, 29-31, 33, 35, 50 and 53).

The current sensor is coupled to measure input current and output current of the battery (claim 25 as applied to claim 22).

A voltage sensor is coupled to provide a measured voltage of the battery to the control circuit (claims 1, 5 and 9 as applied to claims 23 and 32).

The control circuits include integrators and a comparator, the OR circuit (claim 5 as applied to claims 24 and 34).

The circuit includes a microprocessor (claim 14 as applied to claim 26).

The fuel cell and battery are in parallel (claim 7 as applied to claim 27).

Voltage integrator in conjunction with the control circuit is construed to be a voltage regulator since the sensed conditions of the battery are supplied to the controller to analyze the incoming signals and make the necessary adjustments to the system to compensate for variations in battery conditions. Additionally note that the

specification fails to clearly define what the instant invention construes to be a "voltage regulator" (as applied to claim 36).

With respect to the apparatus claims and limitations therein drawn to the operation of the apparatus (claims 28, 30-32, 51-52 and 56-57): the structure of the claimed apparatus of USPAT '682 does not appear to be different from the instant claimed invention. And the manner of using the configuration of claim 28 is not significant with respect to the apparatus since the manner of using does not structurally define the apparatus.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed

apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

A fuel cell system, comprising: a voltage bus; a first fuel cell stack electrically couplable across the voltage bus; a first battery electrically couplable across the voltage bus; a first reactant delivery system for delivering reactant to the first fuel cell stack, the reactant delivery system including at least a first control element adjustable to control a partial pressure in a flow of a reactant to at least some of the fuel cells of the first fuel cell stack; a first control circuit configured to determine a deviation of a voltage difference across the first series pass element from a desired operational condition based on the received signals, the first control circuit further coupled to control the at least first control element based on the determined deviation; a second fuel cell stack electrically couplable across the voltage bus; a second battery electrically couplable across the voltage bus; a second reactant delivery system for delivering reactant to the second fuel cell stack, the reactant delivery system including at least a second control element adjustable to control a partial pressure in a flow of a reactant to at least some of the fuel cells of the second fuel cell stack; and a second control circuit configured to determine a deviation of a voltage difference across the second series pass element from a desired operational condition based on the received signals, the second control circuit further coupled to control the at least second control element based on the determined deviation (claim 51 as applied to claim 58).

The second fuel cell stack and the second battery are electrical coupled in series with the first fuel cell stack and the first battery (claim 52 as applied to claim 59).

The second fuel cell stack and the second battery are electrical coupled in parallel with the first fuel cell stack and the first battery (claim 53 as applied to claim 60).

The fuel cell system further comprising: a third fuel cell stack electrically couplable across the voltage bus; a third battery electrically couplable across the voltage bus; a third reactant delivery system for delivering reactant to the third fuel cell stack, the reactant delivery system including at least a third control element adjustable to control a partial pressure in a flow of a reactant to at least some of the fuel cells of the third fuel cell stack; and a third control circuit configured to determine a deviation of a voltage difference across the third series pass element from a desired operational condition based on the received signals, the third control circuit further coupled to control the at least third control element based on the determined deviation (claim 54 as applied to claim 61.

The fuel cell system of claim 51, further comprising: a third fuel cell stack electrically couplable across the voltage bus; a third battery electrically couplable across the voltage bus; a third reactant delivery system for delivering reactant to the third fuel cell stack, the reactant delivery system including at least a third control element adjustable to control a partial pressure in a flow of a reactant to at least some of the fuel cells of the third fuel cell stack; and a third control circuit coupled to receive signals configured to determine a deviation of a voltage difference across the third series pass element from a desired operational condition based on the received signals,

the third control circuit further coupled to control the at least third control element based on the determined deviation (claim 55 as applied to claim 62).

The fuel cell system of claim 51, further comprising: a third fuel cell stack electrically couplable across the voltage bus; a third battery electrically couplable across the voltage bus; a third reactant delivery system for delivering reactant to the third fuel cell stack, the reactant delivery system including at least a third control element adjustable to control a partial pressure in a flow of a reactant to at least some of the fuel cells of the third fuel cell stack; and a third control circuit coupled to receive signals configured to determine a deviation of a voltage difference across the third series pass element from a desired operational condition based on the received signals, the third control circuit further coupled to control the at least third control element based on the determined deviation (claim 56 as applied to claim 63).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached on (703) 308-2383. FAX communications should be sent to the appropriate FAX number: (703) 872-9311 for After Final Responses only; (703) 872-9310 for all other responses. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry of a

general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gregg Cantelmo
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gc

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